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Photometric campaigns for the Blazhko Project

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A large fraction of the RR Lyrae stars are modulated on time scales of typically tens to hundreds of days. Though this phenomenon, denoted the Blazhko effect, has been discovered a century ago (Blazhko 1907), there is still no consensus on its cause. The Blazhko Project is an international collaboration focused on understanding the modulation. We discuss some results of the photometric multi-site campaigns so far, and their implications for the models proposed to explain the Blazhko effect.

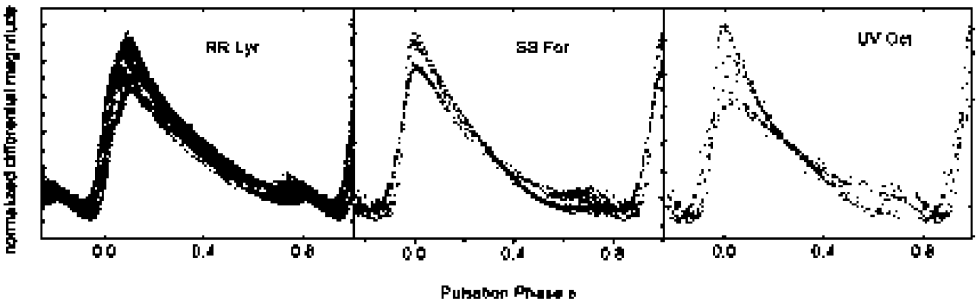

Figure 1: Light curves of three Blazhko stars monitored by the Blazhko Project, folded with their respective pulsation periods

Since the study of Blazhko phenomenon is still in an experimental phase, the observational approach seems to be the most effective way to cast more light on it. Simultaneous photometric and high-resolution spectroscopic data combined with mode identification techniques devised for RR Lyrae stars are likely to give clues. This is the approach adopted by the Blazhko Project. Our photometric data were recorded with photomultipliers and CCD cameras using 15 different telescopes in the range of 0.25 to 1.0 m and have a precision ranging from 2 up to 15 mmag. A dozen selected targets have been observed so far from both hemispheres yielding over 1500 hours of photometric data. For instance, a combined photometric (Kolenberg et al. 2006) and spectroscopic campaign was devoted to RR Lyr in 2004. We also carried out detailed observations and analyses of southern field Blazhko targets (see also Fig. 1).

Multi-site campaigns involving observatories at complementary longitudes allow for a quasi-continuous coverage of the light variations. It is crucial to sufficiently cover both the pulsation cycle (typically around half a day) and the longer Blazhko cycle. More details can be found on the dedicated Blazhko Project website (`http://www.univie.ac.at/tops/blazhko/`). Some implications of our photometric studies are summarized below.

Changing Blazhko periods, as observed in several stars (e.g., Kolenberg et al. 2006, LaCluyzé et al. 2004) challenge the models linking the modulation period directly to the rotation of the star. Features in the light curve such as the hump and bump (Guggenberger

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& Kolenberg 2006) show variability in phase with the Blazhko period. Nonlinear convective pulsation models for RR Lyrae stars (Feuchtinger 1999) involving only radial modes cannot easily reproduce the observed Fourier parameters at different Blazhko phases (Pikall, private communication).

The nonlinear behaviour of the radial mode, especially strong in RRab stars, complicates an identification of the nonradial modes supposed to be responsible for the Blazhko effect. Whereas high-resolution spectra provide more information on the pulsation modes (see, e.g., Kolenberg 2002, for a spectroscopic mode identification), photometric data are easier to obtain in sufficient amounts. Photometric mode identification in RR Lyrae stars is hampered by the incomplete knowledge of the phase-amplitude relation of the temperature and displacement variations, and its applicability is still being tested. Data obtained in different photometric passbands are crucial to increase the discriminating power.

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Patrick Lenz and Katrien Kolenberg in the final stages – of preparing their posters.